REMARKS

Claims 1, 6-22 and 24-27 remain in this application. Claims 1 and 6-27 are rejected. Claim 23 is cancelled. Claims 2-5 are previously cancelled. Claims 1, 6, 13 and 18 are amended herein to clarify the invention, to express the invention in alternative wording, to broaden language as deemed appropriate and to address matters of form unrelated to substantive patentability issues.

The applicant and applicant's attorney appreciate the Examiner's granting of the telephone interview conducted on January 10, 2008, and extend their thanks to the Examiner for her time and consideration.

While no formal agreement was reached, the Examiner indicated that applicant's arguments directed to the relatively low pressure differential (less than ambient atmospheric pressure, typically about 14.7 psi at sea level) practiced in the presently claimed invention directed to internally cleaning a coil pipe of a heat exchanger, as compared with the much elevated 1000-10000 psi range indicated as suitable for the same purpose of cleaning heat exchangers in the applied art of record (i.e., Barry et al.), must reflect a positive recitation in the claims, lest the arguments in favor of patentability be considered not to be commensurate with the scope of the claims. While the Examiner appeared to have acknowledged, during the course of the interview, that if applicant could establish a major difference in the pressures used to move the cleaning implements (ice/water or pigs) through the tube(s) to be cleaned,

she might consider the approaches to be patentably distinct, the Examiner further indicated that adding a limitation directed to a value of the negative pressure used in the claimed invention may result in a new matter rejection. In this latter regard, applicant has included herewith independent documentation downloaded from an Internet website (www.alphainstruments.com) for the Examiner's edification, supporting applicant's position that an absolute value of negative pressure exerted on an object cannot exceed the ambient atmospheric pressure in a tube open at the other end thereof to the atmosphere, since a perfect vacuum (suction) is 0 psi, and negative pressure cannot therefor be greater than a difference between ambient pressure (approx. 14.7 at sea level) and the reference 0 psi. (See, in particular, the definition of Vacuum Pressure, wherein it is stated that full vacuum, which is the maximum than can be ever achieved, produces a negative pressure of about 14.7 psi). Therefore, no new matter is added by reference to this well known physical property of pressure and vacuum.

The claims are amended in accordance with what is believed to be the general direction and spirit of the interview, as discussed in detail below.

Applicant herein traverses and respectfully requests reconsideration of the rejection of the claims and objection cited in the above-referenced Office Action.

The drawings are objected to under 37 CFR 1.83(a) as allegedly not showing every feature specified in the claims. It is believed that this rejection is based upon the subject matter of claim 23 which includes a recitation directed to a heat transfer

medium feeding pipe and heat transfer medium discharging pipe not shown in the figures. Therefore, the cancellation of claim 23 renders this rejection moot.

Claims 1, 7, 9, 11 and 25-27 are rejected as obvious over Barry (US 4,724,007) in view of Sameshima (JP01-028625) and further in view of Withers Jr. (4,007,774) under 35 U.S.C. §103(a). The applicant herein respectfully traverses this rejection. For a rejection under 35 U.S.C. §103(a) to be sustained, the differences between the features of the combined references and the present invention must be obvious to one skilled in the art.

It is respectfully submitted that a *prima facie* case of obviousness could not established in the rejection of claims 1, 7, 9, 11 and 25-27. "To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on the applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)." MPEP §706.02(j) "Contents of a 35 U.S.C. §103 Rejection".

The presently rejected claims are directed specifically to a method of cleaning heat exchangers, in accordance with which, a mixture of ice and water is drawn from a hopper through the heat exchange tube or tubes by applied suction. It is applicant's position that one skilled in the art would not have the requisite guidance or reasonable expectation of success by using the proffered combination of references without application of impermissible hindsight, as explained more fully below.

Barry el al., as discussed above, while relating generally to the cleaning of tubing in heat exchangers, utilizes pigs propelled under very high pressure, which are sized to closely match an interior cross-section of the clogged tubing, such that each pig essentially operates like a high velocity piston specifically requiring great levels of pressure behind it in order to successfully drive it through the tube in a reliable manner, rather than using mere relatively low level negative pressure created by suction from the other side of the tube as a motion imparting mechanism. The invention disclosed in Barry et al. relies on such intentional dimensioning of the pig (which may be made of ice), since the functioning of the method requires a pressure build-up on the back of the pig to propel it (see, for example, col. 3, lines 7-20).

It is notable that, because of this sizing closely matching the interior diameter of the piping, jamming of ice in the tubes is a recognized problem (See col. 4, lines 27-31 of Barry), and would therefore preclude the use of mere suction, as opposed to the disclosed high pressure, since even the slightest irregularity of the tube would cause a jam when only a small pressure drop (i.e., between ambient pressure and the

applied suction) were present. Therefore, the teachings of Barry et al. cannot effectively be applied to any method which teaches the use of suction, for example as disclosed in the Sameshima reference, since its principles of operation are diametrically opposed thereto, and would be counterproductive if one were to attempt to alter same for use with a suction-operated method rather than a pressure-propelled method.

Additionally, there is no instruction or suggestion given in the reference as to how ice pigs of the disclosed shape and size could conceivably be simply drawn into the coil pipe from the hopper merely by the operation of an applied suction, as claimed, particularly since the disclosed method requires <u>careful hand-loading and positioning of a pig into a tube</u> prior to the applying of propelling pressure behind it.

Quite significantly, the disclosure of Barry et al. theorizes that cleaning takes place, not as a result of scraping, but rather due to "the result of cavitation in the wake of the pig produced by a toroidal vortex generated at the rear of the pig by the viscous attachment of the cleaning liquid to the tube wall." (See also col. 3, line 63-col. 4, line 6). Thus, it is clear that one of ordinary skill in the art would not expect the same phenomenon to occur when drawing a slurry of ice and water through a tube by operation of a pulled suction at a negative pressure not to exceed the value of ambient atmospheric pressure, i.e. approximately -14.7 psi at sea level, as claimed, and therefore there would be no requisite likelihood for success in applying such modification.

Barry et al. clearly requires high pressure well above ambient atmospheric pressure (in fact a minimum suitable pressure 68 times greater than atmospheric conditions) to keep it from jamming in the tube. Barry et al. states that "[s]uitably the pressures used are in the range from 1,000 to 10,000 psi, preferably from 1,000 to 6,000 psi." (col. 4, lines 47-49, emphasis added). By the plain language of this disclosure, the corollary would dictate that anything outside this range would be unsuitable, i.e. inappropriate, for practice of Barry et al.. Surely, with the much smaller pressure differential created by the simple application of suction (which according to well known and immutable principles amounts to a maximum of approximately 14.7 psi difference between atmospheric pressure and a perfect vacuum at sea level) one skilled in the art would not expect the method of Barry et al. to succeed.

The secondary Sameshima reference, which is cited for its teaching relating to applied suction and a supplied ice and water mixture, relates specifically to cleaning of waste and water supply piping in domestic plumbing. There is no indication that the same fouling agents present in sewer and water lines will have the same characteristics as those encountered in heat exchangers. For example, Barry et al. states that paraffin is a fouling agent in heat exchangers, and teaches that a pig is used to clear it from the tube. However, in a waste system, such as in Sameshima, it is doubtful whether such deposits of this nature are encountered. Hence, one skilled in the art would not a have a reasonable expectation of success in cleaning heat

exchangers by application of a flushing method relating simply to domestic pipes, particularly since the use of pigs, long used in the cleaning of heat exchangers, teaches that the pigs are propelled by pressure, and have a diameter large enough to scrape the accumulated deposits in the pipes as it passes therealong.

Lastly, Withers Jr., cited specifically for the premise of periodic flow reversal, lacks any disclosure providing the requisite motivation for combination of the references, or likelihood for success in cleaning heat exchanger tube(s) using a water and ice mixture drawn by suction into the tube(s) from a hopper merely by the operation of suction, that is missing from both Barry et al. and Sameshima. Thus, applicant respectfully submits that the Examiner is applying impermissible hindsight in making the combination upon which the rejection is based. Moreover, even if combined, the approach of Barry et al. would not be functional based upon its enabling disclosure. In particular, pigs of a diameter approximating an internal pipe diameter would not be drawn from a hopper by operation of applied suction since the pigs require careful positioning and alignment with the pipe entrance, and also would easily jam in an obstruction without high pressure behind the pig to clear the jam.

It is respectfully submitted that the rejected claims are not obvious in view of the cited references for the reasons stated above. Reconsideration of the rejections of claims 1, 7, 9, 11 and 24-27 and their allowance are respectfully requested.

Claims 6, 8, 10 and 12 are rejected as obvious over Barry (US 4,724,007) in view of Sameshima (JP01-028625) and further in view of Withers Jr. (US 4,007,774)

and further in view of Leon et al. (US 4,327,560) under 35 U.S.C. §103(a). The applicant herein respectfully traverses this rejection.

These rejections differ from those applied to claim 1 in regard to the additional Leon et al. reference, used for the teaching relating to the use of copper coils. Since Leon et al. fails to provide what is lacking from the remaining references, discussed above in detail relating to claim 1, in is respectfully submitted that a *prima facie* case of obvious has not been established. Therefore, reconsideration of the rejections of claims 6, 8, 10 and 12 and their allowance are respectfully requested.

Claims 13-17 are rejected as obvious over Barry (US 4,724,007) in view of Sameshima (JP01-028625) and further in view of Williams Jr. (US 5,499,639) under 35 U.S.C. §103(a). The applicant herein respectfully traverses this rejection.

It is respectfully submitted that <u>none</u> of the references teach the simultaneous passage of cleaning agents, such as ice, through parallel pipes interconnecting headers. Williams, Jr., which is being cited as allegedly teaching that heat exchangers can <u>structurally</u> have inlet and outlet headers to provide communication between a plurality of tubes, fails, however, to teach a <u>method</u> of cleaning such existing arrangement of plural pipes (tubes) by simultaneous passage "internally through said at least two coil pipes." Rather, and in stark contrast with the present invention as claimed in independent claim 13, the tubes in Williams, Jr. are cleaned <u>one at a time</u> (See, for example, Fig. 1), as are the pipes in both Barry et al. and Sameshima. The claims in their present form positively recite the <u>simultaneous passing the ice and</u>

water mixture through two coil pipes arranged between headers, to amplify this distinction.

While applicant acknowledges that Barry et al. includes a passage stating that the method can be applied "simultaneously to a selected number of said tubes." (see col 5, lines 19-24), the disclosure importantly goes on to say that "the pump may be connected to a pressure manifold to which a number of pressure outlets are connected. ... However, generally speaking this manifold embodiment cannot be used to launch a number of pigs simultaneously, since the pressure drop on opening a number of valves simultaneously would be unacceptable." (col. 5, lines 26-38, emphasis added). Thus, again Barry et al. emphasizes the need for high pressure in the indicated range of 1000-10,000 psi in order to function properly or, indeed, at all. In stark contrast, the claimed invention accomplishes simultaneous passing of ice and water by mere application of suction which creates a negative pressure of no more magnitude than ambient atmospheric pressure, i.e., approximately <14.7 psi.

Furthermore, the claims as written recite connecting a hopper containing an ice and water mixture to a one of said first header or said second header, and applying suction to a remaining one of the first header or said second header to cause the ice and water mixture to be suctioned into the other one of said first header or said second header and to simultaneously pass internally through the at least two coil pipes. This, too, is in stark contrast to the teachings of Barry et al. which require careful loading of the cleaning pigs one at a time into each tube, even if cleaned simultaneously.

Moreover, in order to load the pigs, any header present at the side of the tubes at which the pigs are loaded would have to be removed to reach the tube openings.

As noted above, both Sameshima and Williams Jr. are devoid of teaching directed to simultaneous cleaning of multiple tubes.

It is respectfully submitted that the rejected claims are not obvious in view of the cited references for the reasons stated above. Reconsideration of the rejections of claims 13-17 and their allowance are respectfully requested.

Claims 18-24 are rejected as obvious over Barry (US 4,724,007) in view of Sameshima (JP01-028625) under 35 U.S.C. §103(a). The applicant herein respectfully traverses this rejection.

Independent claim 18 includes applying suction to an inlet or an outlet of a coil pipe so that the ice and water mixture is suctioned from a hopper into the other of the inlet or the outlet and caused to flow internally through the coil pipe towards the suction end. The claim is amended to positively recite that "a negative pressure created by said suction does not exceed a value equal in magnitude to ambient atmospheric pressure." Thus, the pressures present are negative, thereby not placing stress on the coil pipe that could potentially cause a rupture, as in Barry et al., and such negative pressure is about <14.7 psi as compared to a minimum suitable pressure of 1000 psi taught by Barry et al. Thus, the arguments offered in favor of claims 1, 7, 9, 11 and 25-27, and discussed in great detail above herein, are applicable generally to these rejected claims in support of patentability thereof.

It is respectfully submitted that the rejected claims are not obvious in view of the cited references for the reasons stated above. Reconsideration of the rejections of claims 18-24 and their allowance are respectfully requested.

No fee is believed due. If there is any fee due the USPTO is hereby authorized to charge such fee to Deposit Account No. 10-1250.

In light of the foregoing, the application is now believed to be in proper form for allowance of all claims and notice to that effect is earnestly solicited.

Respectfully submitted,

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Alpha Instruments, Inc.

Absolute Pressure	Pressure measured relative to high vacuum, often measured in PSIA (Pound per Square Inch, Absolute), or in Torr. Full vacuum is 0 PSIA or 0 Torr, atmosphere is about 14.7 PSIA or 760 Torr.
Barometric pressure	Atmosphere pressure measured relative to high vacuum, often measured in millibars. Atmosphere is about 1013 mbar.
Differential Pressure	Pressure measured relative to a reference side, often measured in PSID(Pound per Square Inch, Differential), inch of water column or in Pascal.
Gage Pressure	Pressure measured relative to ambient atmosphere pressure, often measured in PSIG (Pound per Square Inch, Gage), or in Pascal.
Vacuum Pressure	Pressure measured relative to ambient atmosphere pressure, often measured in PSIV (Pound per Square Inch, Vacuum). Atmosphere is 0 PSIV, full vacuum is about 14.7 PSIV.

Pressure Transducer	A pressure sensing device with voltage output.
Pressure Transmitter	A pressure sensing device with current output. The typical output range is 4 to 20 mA.

Accuracy	Combined error of non-linearity, hysteresis and non-repeatability. Often use RSS (Root Sum of the Squares) method.
Hysteresis	The maximum output difference at any pressure point, when the point was reached first by increasing pressure and then by decreasing pressure.
Non-linearity	Sometimes referred to as linearity. It is the maximum deviation of the output at any pressure points comparing with a straight line.
Non-repeatability	Sometimes referred to as repeatability. It is the maximum output difference at any pressure point, when the pressure is applied under the same condition.